

Understanding an Actuarial Valuation Report

Commonwealth of Massachusetts
Public Employee Retirement Administration Commission



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Public Employee Retirement Administration Commission

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Understanding an Actuarial Valuation Report

James R. Lamenzo, *PERAC Actuary*

Actuary's Letter

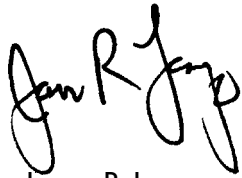
It is essential that Retirement Board Members understand valuation reports in order to effectively complete their fiduciary duties.

The purpose of this publication is to provide an advanced perspective on valuation reports and their complexities.

If you are unfamiliar with actuarial valuations, more fundamental information is available in the PERAC publication *Actuarial Valuation Basics*, available online at www.mass.gov/perac or in print form by request.

Contained in this booklet is a complete valuation of the fictional Quabbin Retirement Board. Key points about the valuation are discussed on the shaded pages.

If you have any questions regarding a PERAC valuation of your retirement system or of a more general nature, please do not hesitate to contact me.

A handwritten signature in black ink, appearing to read "James R. Lamenzo". The signature is stylized with a large, looped "J" and "L".

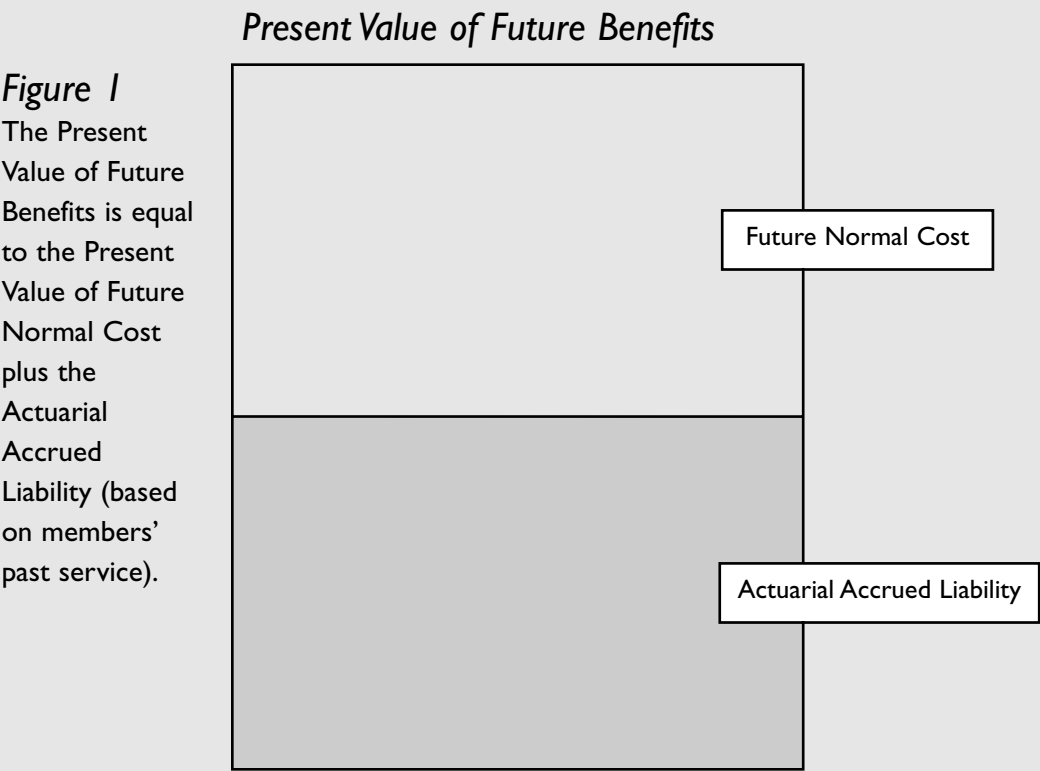
James R. Lamenzo
PERAC Actuary

Table of Contents

Section	Page
Introduction to Present Value of Future Benefits	2
<i>Quabbin Actuarial Valuation Report</i>	
1. Introduction and Certification	5
2. Executive Summary	
A. Costs under Current Valuation	7
B. Comparison with Prior Valuation	9
C. Gain/Loss Analysis and Plan Funding Schedule	13
3. Summary of Valuation Results	15
4. Appropriation Development for Fiscal Year 2003	
A. Derivation of Appropriation	17
B. Current Funding Schedule	19
5. GASB Statement No. 25: Actuarial Information	21
6. Plan Assets	
A. Breakdown of Assets by Investment Type	23
B. Breakdown of Assets by Fund	23
C. Market Value of Assets	23
D. Actuarial Value of Assets	23
7. Information on System Membership	
A. Active Members	25
B. Retirees and Survivors	29
8. Valuation Cost Methods	
A. Actuarial Cost Method	33
B. Asset Valuation Method	33
9. Actuarial Assumptions	35
10. Summary of Plan Provisions	38
11. Glossary of Terms	44

Introduction to Present Value of Future Benefits

The Present Value of Future Benefits, represented by the three diagrams that follow, is the basis for determining plan costs and liabilities.



Introduction to Present Value of Future Benefits (cont.)

Figure 2
The Unfunded Actuarial Accrued Liability (UAL) is equal to the Actuarial Accrued Liability less Plan Assets.

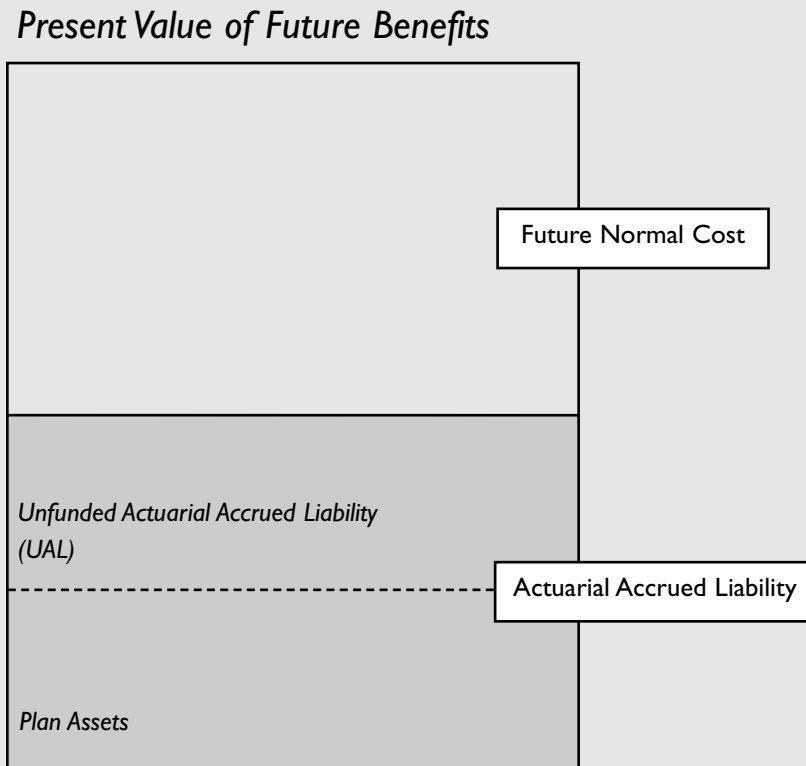
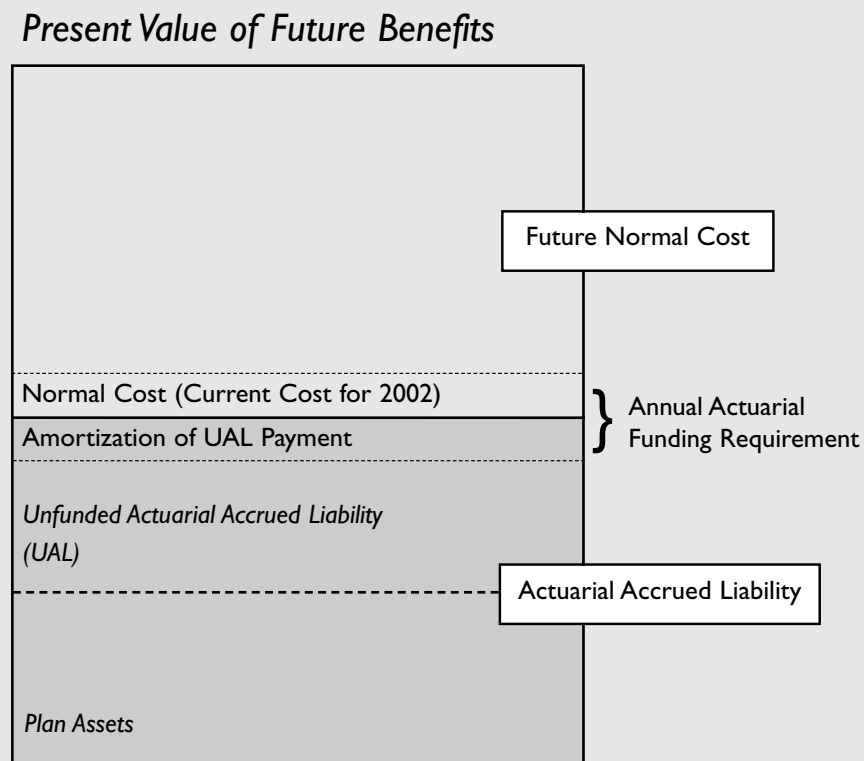


Figure 3
The Annual Actuarial Funding Requirement is equal to the Normal Cost plus the Amortization of Unfunded Actuarial Accrued Liability (UAL) Payment.



Key Points & Concepts

The opening Introduction and Certification section of the valuation provides the reader with an overview of the data used to prepare the report and the actuary's certification that the valuation was performed in a professional manner.

1

An actuarial valuation of a retirement plan is an estimate of a plan's financial position at a specific point in time. During a valuation, an actuary takes a "snapshot" of the membership as of a given date to determine the plan's liabilities and funded status. A valuation estimates the present value of expected future cash flows.

2

The two components that determine the valuation results are member census data and financial data. Although PERAC reviews member and financial data for reasonableness, PERAC does not audit the information as part of the valuation.

3

Each actuarial assumption should be reasonable.

How good are the assumptions?

- Gains and losses are determined at each valuation based on actual vs. expected experience.

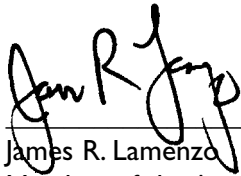
Scheduling Valuations: Adherence to a schedule of regular valuations is likely to result in the early identification of trends and appropriate adjustments being made on a timely basis. Periodic valuations enable a retirement board to guard against an unexpected and sizable increase in a system's funding schedule and appropriation amount.

Although Chapter 32 requires triennial valuations, PERAC recommends performing valuations at least every two years. In addition, we recommend interim estimated valuations be performed in off years. In the private sector annual valuations are required. PERAC's goal, with the help of private actuaries, is to conduct a valuation of each retirement system at least every two years.

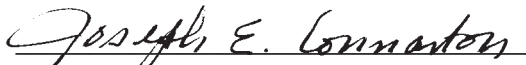
I. INTRODUCTION & CERTIFICATION

- 1** This report presents the results of the actuarial valuation of the Quabbin Contributory Retirement System. The valuation was performed as of January 1, 2002 pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts.
- 2** This valuation was based on member data as of December 31, 2001, which was supplied by the retirement board. Such tests as we deemed necessary were performed on the data to ensure accuracy. Asset information as of December 31, 2001 was provided in the Annual Statement for the Financial Condition as submitted to this office in accordance with G.L. c. 32, ss. 20(5)(h), 23(1)(c) and 23(2)(e). Both the membership data and financial information were reviewed for reasonableness, but were not audited by us.
- 3** In our opinion, the actuarial assumptions used in this report are reasonable, are related to plan experience and expectations, and represent our best estimate of anticipated experience under the system. We believe this report represents an accurate appraisal of the actuarial status of the system performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

Respectfully submitted,
Public Employee Retirement Administration Commission



James R. Lamenzo
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 99-4709



Joseph E. Connarton
Executive Director

Dated: June 30, 2002

Key Points & Concepts

The Executive Summary of the PERAC Valuation is made up of three sections highlighting the most important aspects of the report. The summary presents the system's costs and liabilities, and the cost in the next fiscal year under the plan's current funding schedule. It also provides a comparison with the results of the previous actuarial valuation, and a brief analysis of actuarial gains or losses for the system.

1

Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits, which is accrued in the current year. The Employee Normal Cost is the amount of the expected employee contributions for the year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

2

Actuarial Accrued Liability can be described in the following ways:

- The present value of future benefits based on a member's service to date
- The accumulation of past normal costs
- Present value of Future Benefits less Present Value of Future Normal Cost
- Past service liability (but with projected assumptions)

Determining System Liabilities: For the purposes of an actuarial valuation, liabilities include Total Normal Cost and Total Actuarial Accrued Liability for the system.

- *Total Normal Cost* for the System is the sum of Normal Cost for each individual member.
- *Total Actuarial Accrued Liability* for the System is the sum of the Actuarial Liability for each individual member.

2. EXECUTIVE SUMMARY

PART A | COSTS UNDER CURRENT VALUATION

The results of the January 1, 2002 actuarial valuation are as follows:

1	Total Normal Cost	\$2,781,400
	Expected Employee Contributions	<u>\$1,433,800</u>
	Net Normal Cost	<u>\$1,347,600</u>

2	Total Actuarial Liability	\$86,487,600
	Assets	<u>\$55,000,000</u>
	Unfunded Actuarial Liability	\$31,487,600

The Board recently adopted a funding schedule effective in FY03. The appropriation for FY03 under this schedule is shown below.

Current Funding Schedule for the Fiscal Year Beginning July 1, 2002

	Dollar Amount	Percent of Payroll
Normal Cost (adjusted for timing)	\$1,455,408	7.8%
Estimated Administrative Expense	\$50,000	0.3%
Amortization of Unfunded Actuarial Liability (26 year, 2.5% increasing)	\$2,327,648	12.6%
Amortization of increase in liability due to ERI (5 year level)	<u>\$10,000</u>	0.0%
Total	\$3,843,056	20.7%

All amounts assume appropriations will be made January 1.

Key Points & Concepts

- 1 In the chart at right, Total Normal Cost has increased only slightly and Net Normal Cost has decreased over the two year period. This reflects the assumption change due to the *Local Experience Study Analysis* published by PERAC in March, 2002.
- 2 Note that the Unfunded Liability increased and the Funded Ratio decreased primarily due to the actual investment return.

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION

The last full valuation was performed by PERAC as of January 1, 2000. Our recently completed experience study forms the basis for the actuarial assumptions used in this valuation. Below we have shown the comparison between the valuations as of January 1, 2000 and January 1, 2002.

	PERAC 1/1/02	PERAC 1/1/00	Increase (Decrease)	Increase (Decrease)
Total Normal Cost	\$2,781,400	\$2,700,000	\$81,400	3.0%
Expected Employee Contributions	1,433,800	<u>\$1,300,000</u>	<u>133,800</u>	10.3%
Net Normal Cost	\$1,347,600	<u>\$1,400,000</u>	<u>(\$52,400)</u>	(3.7%)
Actuarial Liability				
Actives	\$45,466,500	\$40,000,00	\$5,466,500	13.7%
Retirees and Inactives	<u>41,021,100</u>	<u>\$35,000,000</u>	<u>6,021,100</u>	17.2%
Total	\$86,487,600	\$75,000,000	\$11,487,600	15.3%
Assets	<u>55,000,000</u>	<u>52,000,000</u>	<u>3,000,000</u>	5.8%
Unfunded Actuarial Liability	<u>\$31,487,600</u>	<u>\$23,000,000</u>	<u>\$8,487,600</u>	36.9%
Funded Ratio	63.6%	69.3%	(5.7%)	

Key Points & Concepts

Illustration of Salary Gain or Loss (Not based on the Quabbin Valuation)

VALUATION DATE	1/01	1/02
ALL MEMBERS		
Active Members	200	240
Total Pay	\$6,000,000	\$7,320,000
% Increase		22.0%
Average Pay	\$30,000	\$30,500
% Increase		1.7%
CONTINUING MEMBERS		
Active Members	200	200
Total Pay	\$6,000,000	\$6,520,000
% Increase		8.7%
Average Pay	\$30,000	\$32,600
% Increase		8.7%

Salaries increase 8.7% for continuing members during 2001.

2. EXECUTIVE SUMMARY *(continued)*

PART B | COMPARISON WITH PRIOR VALUATION *(continued)*

Actives	PERAC 1/1/02	PERAC 1/1/00	% Difference
Number	649	625	3.8%
Total Payroll	\$18,542,618	\$15,625,000	18.7%
Average Salary	\$28,571	\$25,000	14.3%
Average Age	46.5	46.0	1.1%
Average Service	10.8	10.5	2.9%

Retirees and Survivors	PERAC 1/1/02	PERAC 1/1/00	% Difference
Number	359	340	5.6%
Total Benefits*	\$3,993,531	\$3,400,000	17.5%
Average Benefits*	\$11,124	\$10,000	11.2%
Average Age	72.4	72.8	(0.5%)

*excluding State reimbursed COLA

Key Points & Concepts

- 1 Most plans did not meet their investment return assumption over the 2-year period. Many plans had negative returns over this period.
- 2 Increases in pay that are greater than assumed produce actuarial losses. Note this loss is not attributable to the change in actuarial assumptions resulting from the *Local Experience Study Analysis* published by PERAC in March, 2002.
- 3 Please see the *Local Experience Study Analysis* published by PERAC in March, 2002.
- 4 On page 18 of this document, we outline the appropriation at selected years for a number of alternative schedules.

2. EXECUTIVE SUMMARY *(continued)*

PART C | GAIN/LOSS ANALYSIS AND PLAN FUNDING SCHEDULE

- 1** Since the last valuation, plan experience in aggregate was less favorable than assumed. There was an actuarial loss on plan assets since the actual rate of return was less than the 8.0% annual assumed rate over the 2-year period. The rates of return for 2000 and 2001 were 1.0% and (5.0%) respectively. There was an asset loss on a market value basis of approximately \$10.5 million over the 2-year period.
- 2** There was also a loss on plan liabilities (before taking into account the change in actuarial assumptions) primarily due to salary increases for continuing members being greater than expected. There was an increase in normal cost due to an increase in the number of active members, and therefore a corresponding increase in total payroll.
- 3** Earlier this year we released our PERAC experience study of local retirement systems. The study analyzed the actual experience over the last four years with respect to retirement, disability, turnover (withdrawal), mortality, and salary increases for approximately 30 systems. As part of that study we revised the actuarial assumptions with respect to retirement, disability, turnover, mortality rates, and the salary scale. The proposed changes are based on both the actual past and anticipated future experience. Changes to the disability, turnover, and salary increase assumptions decreased total plan cost. Changes to retirement rates and using a more current mortality table increased total plan cost. Overall, the revised assumptions produce a total plan cost less than under the prior assumptions.
- 4** The funding schedule presented in this report was recently adopted by the board. This schedule amortizes the unfunded actuarial liability through 2028 with payments increasing 2.5% each year.

We are available to work with you in determining alternative funding schedules at your request.

Key Points & Concepts

1

In the chart at right, Normal Cost and Accrued Liabilities are delineated for retirement (superannuation), death, disability, and withdrawal (termination).

2

Found here are different views of funding using the same components:

- The Actuarial Accrued Liability (\$86,487,600) less plan Assets (\$55,000,000) is equal to the Unfunded Accrued Liability (\$31,487,600).
- The plan Assets (\$55,000,000) divided by the Actuarial Accrued Liability (\$86,487,600) is equal to the Funded Ratio (63.6%).

100% funding

If a retirement system is 100% funded, Normal Cost still applies because member benefits accrue during the current year. Also, 100% funding is a moving target because different valuation systems produce different results. Various percentages can be used as a the benchmark (95%, 105%).

Funding status can (and does) change due to law changes and benefit enhancements.

3. SUMMARY OF VALUATION RESULTS

A. Number of Members on Current Valuation Date	
Active Members	649
Vested Terminated Members	10
Retired Members and Survivors	359
Total	1,018
B. Total Regular Compensation of Active Members	\$18,542,618
C. Normal Cost	
Superannuation	\$1,739,700
Death	161,700
Disability	734,400
Termination	<u>145,600</u>
Total Normal Cost	\$2,781,400
Expected Employee Contributions	<u>1,433,800</u>
Net Employer Normal Cost	\$1,347,600
D. Actuarial Accrued Liability	
Active	
Superannuation	\$38,455,200
Death	1,004,300
Disability	5,161,500
Termination	845,500
Total Active	\$45,466,500
Vested Terminated Members	640,200
Non-Vested Terminated Members	161,200
Retirees and Survivors	40,219,700
Total Actuarial Accrued Liability	\$86,487,600
E. Actuarial Value of Assets (Market Value)	55,000,000
F. Unfunded Accrued Liability (UAL): D - E	31,487,600
G. Funded Ratio: E / D	63.6%

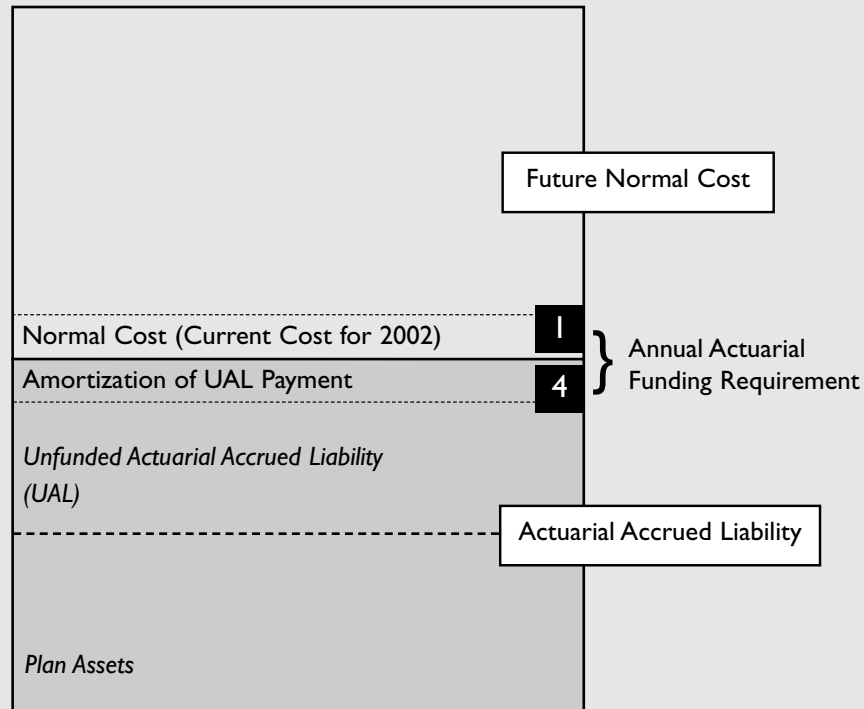
Key Points & Concepts

For further clarification, please see pages 2 and 3.

Figure 3

The Annual Actuarial Funding Requirement is equal to the Normal Cost plus the Amortization of Unfunded Actuarial Accrued Liability (UAL) Payment.

Present Value of Future Benefits



2

Credited with interest to the assumed payment date (in this case 1/1/02 to 1/1/03 at 8.0%)

3

Reflects estimated administrative expenses not including investment related expenses.

5

The Early Retirement Incentive base was established in 1993 on a 15-year level dollar basis.

4. APPROPRIATION DEVELOPMENT FOR FISCAL YEAR 2003

PART A | DERIVATION OF APPROPRIATION

Cost Under Current Funding Schedule

1	1. a. Normal Cost as of January 1, 2002	\$1,347,600
	b. For FY03 (adjusted for timing) 2	1,455,408
	c. Estimated Administrative Expenses 3	50,000
	d. Total Employer Normal Cost (b+c)	\$1,505,408
4	2. a. Unfunded Actuarial Liability as of January 1, 2002	\$31,447,673
	b. FY03 amortization payment (26 year, 2.5% increasing)	\$2,327,648
	3. a. Unfunded Liability due to ERI 5	\$39,927
	b. FY03 amortization payment (5 year level)	\$10,000
	3. Total FY03 Payment [Sum of 1(d), 2(b), and 3(b)]	\$3,843,056

Key Points & Concepts

1 Normal cost is assumed to increase by 5.5% per year in this exhibit.

2 Beginning of the Fiscal Year (BOFY) Balance on the Unfunded Liability:
Under an increasing schedule, the outstanding balance increases for a period of time. In the early years of the schedule, the payments are not large enough to pay the interest on the outstanding balance.

PERAC Approval of Funding Schedules

For comparison, we have shown different schedules for various years below. Note these are for illustration only, as a new schedule would be adopted at least every three years.

(DOLLARS IN THOUSANDS)

AMORTIZATION OF UAL	↑ 4.5%	↑ 2.5%	LEVEL	↑ 4.5%	↑ 2.5%	↑ 4.5%
AMORTIZATION COMPLETE	2028	2028	2028	2026	2026	2020
2003	3,428	3,843	4,887	3,529	3,935	3,976
2010	4,793	4,957	5,562	4,930	5,066	5,538
2020	7,783	7,282	7,112	7,997	7,423	8,941
2028	11,490	10,056	9,112	5,741	5,741	5,741

Conservative Actuarial Approaches

1. Adopt more conservative assumptions for investment return, salary scale, and longevity.
2. Actuarial value of assets
 - Adopted by Commonwealth
 - Reduces volatility
3. Adopt a more aggressive funding schedule.

4. APPROPRIATION DEVELOPMENT FOR FISCAL YEAR 2003

(continued)

PART B | CURRENT FUNDING SCHEDULE (2.5% increasing amortization)

Fiscal Year	1 Normal Cost	Amort. of ERI	Amort. of UAL	Total Cost	2 BOFY Balance
2003	1,505,408	10,000	2,327,648	3,843,056	32,747,087
2004	1,588,205	10,000	2,385,839	3,984,045	32,935,700
2005	1,675,557	10,000	2,445,485	4,131,042	33,078,883
2006	1,767,712	10,000	2,506,623	4,284,335	33,171,489
2007	1,864,937	10,000	2,569,288	4,444,225	33,207,921
2008	1,967,508		2,633,520	4,601,028	33,182,095
2009	2,075,721		2,699,358	4,775,079	33,097,802
2010	2,189,886		2,766,842	4,956,728	32,938,293
2011	2,310,329		2,836,013	5,146,343	32,695,841
2012	2,437,397		2,906,914	5,344,311	32,362,054
2013	2,571,454		2,979,586	5,551,041	31,927,828
2014	2,712,884		3,054,076	5,766,960	31,383,285
2015	2,862,093		3,130,428	5,992,521	30,717,708
2016	3,019,508		3,208,689	6,228,197	29,919,480
2017	3,185,581		3,288,906	6,474,487	28,976,002
2018	3,360,788		3,371,129	6,731,917	27,873,620
2019	3,545,631		3,455,407	7,001,038	26,597,536
2020	3,740,641		3,541,792	7,282,433	25,131,715
2021	3,946,376		3,630,337	7,576,713	23,458,789
2022	4,163,427		3,721,095	7,884,522	21,559,942
2023	4,392,415		3,814,123	8,206,538	19,414,798
2024	4,633,998		3,909,476	8,543,474	17,001,294
2025	4,888,868		4,007,213	8,896,081	14,295,543
2026	5,157,756		4,107,393	9,265,149	11,271,686
2027	5,441,433		4,210,078	9,651,510	7,901,732
2028	5,740,711		4,315,330	10,056,041	4,155,390
2029	6,056,450			6,056,450	0

All amounts assume payments will be made January 1 of each fiscal year.

Key Points & Concepts

1

The Governmental Accounting Standards Board (GASB) established Statement 25. GASB 25 superseded GASB 5 in 1997. The intent of GASB disclosures is to enable readers of financial statements to compare plans on an “apples to apples” basis.

2

This schedule reflects funding progress for the last six years.

5. GASB STATEMENT NO.25: ACTUARIAL INFORMATION

I In November of 1994, GASB issued Statements No. 25, 26 and 27, relating to Financial Reporting and Accounting for Pension Plans. We have included in this report the actuarial information required by Statement No. 25. The requirements of Statement 25 are effective for periods beginning after June 15, 1996.

Schedule of Funding Progress

2	Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL)* (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Cov. Payroll ((b-a)/c)
	1/02	\$55,000,000	\$86,487,600	\$31,487,600	63.6%	\$18,542,618	169.8%
	1/00	\$52,000,000	\$75,000,000	\$23,000,000	69.3%	\$15,625,000	147.2%
	1/97	\$40,000,000	\$60,000,000	\$20,000,000	66.6%	\$13,500,000	148.1%

*excludes State reimbursed COLA

Notes To Schedules

Additional information as of the latest actuarial valuation follows.

Valuation Date	January 1, 2002
Actuarial Cost Method	Individual entry age normal
Amortization Method	2.5% increasing
Remaining Amortization Period	26 years
Asset Valuation Method	Market value

Principal Actuarial Assumptions:

Investment Rate of Return	8.0%
Projected Salary Increases	5.5%

Key Points & Concepts

- Plan assets presented in the chart at right are valued at market value. Assets may also be valued by smoothing or recognizing gains and losses over a period of time (usually 3-5 years). This methodology, which is commonly used in both the public and private sectors, reduces the potential volatility in the market value approach.

State Retirement System Illustration Comparing Market Value to Smoothed Actuarial Value (in 000,000)

	1/1/96	1/1/98	1/1/99	1/1/00	1/1/01	1/1/02
Actuarial Value of Assets (AVA) <i>Smoothed</i>	7,366	9,635	10,847	12,493	13,922	15,002
Market Value of Assets (MVA)	7,366	10,221	11,878	14,686	14,386	13,598
AVA/MVA	100.0%	94.3%	91.3%	85.1%	96.8%	110.3%

Chart Notes

- Actuarial value of assets methodology commenced with 1/1/98 actuarial valuation
- AVA figures as of 1/98, 1/99 and 1/00 reflect the calculated values under the methodology; actual figures were phased in so that AVA/MVA was 97%, 94%, and 91% respectively. Phase-in was completed as of 1/00.

6. PLAN ASSETS

A | BREAKDOWN OF ASSETS BY INVESTMENT TYPE

Cash and Cash Equivalents	\$1,000,000
Short Term Investments	3,000,000
Fixed Income Securities (Market Value)	16,000,000
Equities (Market Value)	27,000,000
PRIT Fund	5,500,000
Interest Due and Accrued	1,000,000
Accounts Receivable	2,000,000
Accounts Payable	<u>(500,000)</u>
Total	\$55,000,000

B | BREAKDOWN OF ASSETS BY FUND

Annuity Savings Fund	\$10,000,000
Annuity Reserve Fund	5,000,000
Pension Fund	10,000,000
Pension Reserve Fund	<u>30,000,000</u>
Total	\$55,000,000

C | MARKET VALUE OF ASSETS

\$55,000,000

D | ACTUARIAL VALUE OF ASSETS

\$55,000,000

I

Key Points & Concepts

Data Review

When the retirement board reviews a valuation report, it is important that they examine Section 7 membership data for reasonableness. The data displayed there represents the culmination of the data clean up process. The process begins with the review of a retirement system's membership data. PERAC's Actuarial Unit prepares listings of **questionable** data items. If data is erroneous, it is essential that corrections be made in the retirement board's database (not just in the copies of the files used by the actuarial team) so that the error(s) will not surface again in future data listings.

PERAC's actuarial software has been designed to provide **warnings** when certain data elements do not appear to match established criteria. The parameters that we use in our reasonableness tests do not change from year to year. For example, PERAC's system will flag the current payable amount for a retiree if the original amount of benefit plus COLAs does not equal the current amount payable. The warning may indeed be triggered by an incorrect entry for original amount of benefit. However, if the member has died and the beneficiary is receiving the benefit or a Section 90C benefit has been granted, the data provided may actually be correct. In such instances, the retirement board should simply annotate the correction on the data list, and return it to the actuary (assuming a full valuation is being performed).

Retirement boards are encouraged to retain PERAC's data listings. Just as actuaries conduct a preliminary review of prior valuation reports before beginning a new valuation study, so should retirement boards conduct a review of prior year(s) data listing(s) before reviewing data listings associated with a current valuation. Since PERAC may identify the same record or records as being questionable each year, retirement board staff can save time by referencing prior year's documentation.

Data clean up is a time-consuming, labor-intensive task—for both retirement board and actuarial staff. It can often represent as much as 75% of the total time involved in completing a valuation. PERAC strongly encourages retirement boards to maintain up-to-date, accurate membership databases. Retirement boards should consider periodically auditing their databases to identify missing and/or erroneous entries. Data maintenance should be viewed as an on-going responsibility rather than an isolated, annual or biennial project.

7. INFORMATION ON SYSTEM MEMBERSHIP

A critical element of an actuarial valuation is accurate and up-to-date membership information. PERAC conducted an extensive review of member data submitted for this valuation.

PART A | ACTIVE MEMBERS

	Actives	Vested Terminations
Number of Members	649	10
Average Age	46.5	45.6
Average Service	10.8	15.3
Average Salary	\$28,571	\$17,832
Average Annuity Savings Fund Balance	\$35,000	\$45,000

Age by Service Distribution of Active Member

Years of Service								
Present Age	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 +	Total
0 - 24	12							12
25 - 29	24	6	1					31
30 - 34	32	16	10	1				59
35 - 39	33	17	13	9				72
40 - 44	51	18	16	15	6	3		109
45 - 49	49	21	15	12	16	8	1	122
50 - 54	32	14	21	11	11	16	8	113
55 - 59	26	11	8	9	6	3	11	74
60 - 64	8	4	4	10	4	3	6	39
65+	1	1	5	6	0	1	4	18
Total	268	108	93	73	43	34	30	649

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART A | ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	12	\$272,873	\$22,739
25 - 29	31	\$839,353	\$27,076
30 - 34	59	\$1,860,396	\$31,532
35 - 39	72	\$2,143,910	\$29,777
40 - 44	109	\$2,960,160	\$27,157
45 - 49	122	\$3,486,552	\$28,578
50 - 54	113	\$3,450,009	\$30,531
55 - 59	74	\$2,021,015	\$27,311
60 - 64	39	\$1,161,263	\$29,776
65+	18	\$347,087	\$19,283
Total	649	\$18,542,618	\$28,571

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES & SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	270	4	23	62	359
Average Age	73.0	71.2	61.5	73.7	72.4
Average Annual Benefit	\$12,150	\$11,625	\$19,330	\$8,255	\$11,932

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Total Annuity	\$465,844	\$3,945	\$30,112	\$27,676	\$527,577
Pension (excluding State reimbursed COLA)	\$2,619,939	\$36,076	\$384,912	\$425,027	\$3,465,954
State reimbursed COLA	\$194,729	\$6,481	\$29,558	\$59,125	\$289,893
Total	\$3,280,512	\$46,502	\$444,582	\$511,828	\$4,283,424

7. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

PART B | RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	1	\$23,504	\$23,504
40 - 44	N/A	N/A	N/A
5 - 49	7	\$126,641	\$18,092
50 - 54	10	\$222,216	\$22,222
55 - 59	25	\$404,046	\$16,162
60 - 64	49	\$820,123	\$16,737
65 - 69	52	\$601,180	\$11,561
70 - 74	65	\$765,465	\$11,776
75 - 79	65	\$672,256	\$10,342
80 - 84	47	\$371,846	\$7,912
85 - 89	24	\$198,183	\$7,147
90+	14	\$77,963	\$5,569
Totals	359	\$4,283,424	\$11,932

Key Points & Concepts

1

The Entry Age Normal Cost Method is required for most Chapter 32 plans.

2

Normal Cost remains level as a percentage of pay except for plan changes and actuarial assumption changes.

3

See Section 6 (page 22) for a comparison of market value and a smoothed actuarial value approach.

8. VALUATION COST METHODS

PART A | ACTUARIAL COST METHOD

1

The Actuarial Cost Method which was used to determine pension liabilities in this valuation is known as the *Entry Age Normal Cost Method*. Under this method the *Normal Cost* for each active member on the valuation date is determined as the level percent of salary, which, if paid annually from the date the employee first became a member of the retirement system, would fully fund by retirement, death, disability or termination, the projected benefits which the member is expected to receive. The *Actuarial Liability* for each member is determined as the present value as of the valuation date of all projected benefits which the member is expected to receive, minus the present value of future annual Normal Cost payments expected to be made to the fund. Since only active members have a Normal Cost, the Actuarial Liability for inactives, retirees and survivors is simply equal to the present value of all projected benefits. The sum of Normal Cost and Actuarial Liability for each member is equal to the Normal Cost and Actuarial Liability for the Plan. The *Unfunded Actuarial Liability* is the Actuarial Liability less current assets.

2

The Normal Cost for a member will remain a level percent of salary for each year of membership except for changes in provisions of the Plan or the actuarial assumptions employed in projection of benefits and present value determinations. The Normal Cost for the entire system will also change due to the addition of new members or the retirement, death or termination of members. The Actuarial Liability for a member will increase each year to reflect the additional accrual of Normal Cost. It will also change if the Plan provisions or actuarial assumptions are changed.

Differences each year between the actual experience of the Plan and the experience projected by the actuarial assumptions are reflected by adjustments to the Unfunded Actuarial Liability. An experience difference which increases the Unfunded Actuarial Liability is called an *Actuarial Loss* and one which decreases the Unfunded Actuarial Liability is called an *Actuarial Gain*.

PART B | ASSET VALUATION METHOD

3

Assets are at market value. Typically most plans in the private sector and many in the public sector use an actuarial value approach that smooths asset gains and losses to reduce the potential volatility in market value and therefore the required appropriation amounts from year to year. We recommend the Board consider this methodology when the next valuation is performed.

Key Points & Concepts

- 1 These assumptions carry the most weight in determining plan costs.

The actuarial assumptions were recently revised in light of the *Local System Experience Study Analysis*. The assumptions shown reflect the current PERAC standard assumption set. Based on the study, changes were made to the following assumptions:

Membership Characteristics

- Longevity
- Termination
- Disability
- Retirement

Economic Variables

- Salary increases

9. ACTUARIAL ASSUMPTIONS

INVESTMENT RETURN

SALARY INCREASE

INTEREST RATE CREDITED TO THE ANNUITY SAVINGS FUND

4.5% per year

8.0% per year	1
5.5% per year	

MORTALITY

RP-2000 Healthy Annuitant table (gender distinct). This is applicable to both pre-retirement and post-retirement benefits. For disabled members, the mortality rate is assumed to be in accordance with the RP- 2000 Table (gender distinct) set forward 3 years for males. It is assumed that 55% of pre-retirement deaths are job-related for Group 1 and 2 members and 90% are job-related for Group 4 members. For members retired under an Accidental Disability, 40% of deaths are assumed to be from the same cause as the disability.

WITHDRAWAL

Based on analysis of past experience. Annual rates are based on years of service. Sample annual rates for Groups 1 and 2 are shown below. For Group 4 members the rate is 0.015 each year for service up to and including 10 years. No withdrawal is assumed thereafter.

Service	Groups 1 & 2
0	0.150
5	0.076
10	0.054
15	0.033
20	0.020

DISABILITY

Based on an analysis of past experience. It is also assumed that the percentage of job-related disabilities is 55% for Groups 1 and 2 and 90% for Group 4.

Age	Groups 1 & 2	Group 4
20	0.00010	0.0010
30	0.00030	0.0030
40	0.00101	0.0030
50	0.00192	0.0125
60	0.00280	0.0085

Key Points & Concepts

Illustration of Impact of Different Investment Return Assumptions

<i>January 1, 2002 Valuation (in thousands)</i>	8.0%	8.5%
1. Total Normal Cost	2,782	2,520
2. Employee Contributions	<u>1,434</u>	<u>1,434</u>
3. Net Normal Cost	1,348	1,086
4. Actuarial Liability		
a. Active	45,467	42,430
b. Retired	<u>41,021</u>	<u>39,600</u>
c. Total (including inactive)	86,488	82,030
5. Assets	55,000	55,000
6. Unfunded Liability: (4c) - (5)	31,488	27,030
7. Funded Ratio: (5) / (4c)	63.6%	67.0%
8. Amortization of Unfunded Liability (26 yr., 2.5% inc.)	2,158	1,936
9. FY03 Appropriation: (3) + (8)	3,786	3,279
with assumed payment date 1/1/03		

Illustration of 0% Return in 2002 on Funding Schedule

<i>(in thousands)</i>	1/02	1/03
1. Total Normal Cost	2,782	2,950
2. Employee Contributions	<u>1,434</u>	<u>1,530</u>
3. Net Normal Cost	1,348	1,420
4. Actuarial Liability		
a. Active	45,467	48,900
b. Retired	<u>41,021</u>	<u>44,000</u>
c. Total (including inactive)	86,488	92,900
5. Assets	55,000	56,000
6. Unfunded Liability: (4c) - (5)	31,488	36,900
7. Funded Ratio: (5) / (4c)	63.6%	60.3%
8. Amortization of Unfunded Liability to 2028	2,158	2,577
9. a. FY03 Appropriation	3,786	n/a
b. FY04 Appropriation	3,924	4,316

Assumed benefit payments \$4.0 million per year. Assumed inv. ret. assumption: 8.0%

9. ACTUARIAL ASSUMPTIONS *(continued)*

RETIREMENT (SUPERANNUATION)

Age	Groups 1 & 2	Group 4
45-49	0.000	0.010
50	0.010	0.100
51	0.010	0.020
52	0.010	0.020
53	0.010	0.050
54	0.010	0.075
55	0.040	0.150
56	0.050	0.100
57	0.055	0.100
58	0.060	0.100
59	0.065	0.150
60	0.075	0.200
61	0.150	0.200
62	0.200	0.250
63	0.180	0.250
64	0.200	0.300
65-67	0.250	1.000
68-69	0.250	1.000
70 and after	1.000	1.000

ADMINISTRATIVE EXPENSES

An amount of \$50,000 has been included in the Normal Cost for FY03. This amount is assumed to increase by the salary increase assumption each year.

10. SUMMARY OF PLAN PROVISIONS

ADMINISTRATION

There are 106 contributory Retirement Systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

PARTICIPATION

Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are 3 classes of membership in the Retirement System:

Group 1:

General employees, including clerical, administrative, technical and all other employees not otherwise classified.

Group 2:

Certain specified hazardous duty positions.

Group 4:

Police officers, firefighters, and other specified hazardous positions.

MEMBER CONTRIBUTIONS

Member contributions vary depending on the most recent date of membership:

Prior to 1975:	5% of regular compensation
1975 - 1983:	7% of regular compensation
1984 to 6/30/96:	8% of regular compensation
7/1/96 to present:	9% of regular compensation
1979 to present:	an additional 2% of regular compensation in excess of \$30,000.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

RATE OF INTEREST

Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least 10 financial institutions.

RETIREMENT AGE

The mandatory retirement age for some Group 2 and Group 4 employees is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for employees in Group 1.

SUPERANNUATION RETIREMENT

A member is eligible for a superannuation retirement allowance (service retirement) upon meeting the following conditions:

- completion of 20 years of service, or
- attainment of age 55 if hired prior to 1978, or if classified in Group 4, or
- attainment of age 55 with 10 years of service, if hired after 1978, and if classified in Group 1 or 2

AMOUNT OF BENEFIT

A member's annual allowance is determined by multiplying average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his creditable service. The amount determined by the benefit formula cannot exceed 80% of the member's highest three year average salary. For veterans as defined in G.L. c. 32, s. 1, there is an additional benefit of \$15 per year for each year of creditable service, up to a maximum of \$300.

- Salary is defined as gross regular compensation.
- Average Salary is the average annual rate of regular compensation received during the 3 consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

AMOUNT OF BENEFIT *(continued)*

- The Benefit Rate varies with the member's retirement age, but the highest rate of 2.5% applies to Group 1 employees who retire at or after age 65, Group 2 employees who retire at or after age 60, and to Group 4 employees who retire at or after age 55. A .1% reduction is applied for each year of age under the maximum age for the member's group. For Group 2 employees who terminate from service under age 55, the benefit rate for a Group 1 employee shall be used.

DEFERRED VESTED BENEFIT

A participant who has completed 10 or more years of creditable service is eligible for a deferred vested retirement benefit. Elected officials and others who were hired prior to 1978 may be vested after 6 years in accordance with G.L. c. 32, s. 10.

The participant's accrued benefit is payable commencing at age 55, or the completion of 20 years, or may be deferred until later at the participant's option.

WITHDRAWAL OF CONTRIBUTIONS

Member contributions may be withdrawn upon termination of employment. Employees who first become members on or after January 1, 1984, may receive only limited interest on their contributions if they voluntarily terminate their service. Those who leave service with less than 5 years receive no interest; those who leave service with greater than 5 but less than 10 years receive 50% of the interest credited.

DISABILITY RETIREMENT

The Massachusetts Retirement Plan provides 2 types of disability retirement benefits:

ORDINARY DISABILITY

Eligibility: Non-veterans who become totally and permanently disabled by reason of a non-job related condition with at least 10 years of creditable service (or 15 years creditable service in systems in which the local option contained in G.L. c. 32, s.6(1) has not been adopted).

Veterans with ten years of creditable service who become totally and permanently disabled by reason of a non-job related condition prior to reaching "maximum age".

Retirement Allowance: Equal to the accrued superannuation retirement benefit as if the member was age 55. If the member is a veteran, the benefit is 50% of the member's final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

ACCIDENTAL DISABILITY

Eligibility: Applies to members who become permanently and totally unable to perform the essential duties of the position as a result of a personal injury sustained or hazard undergone while in the performance of duties. There are no minimum age or service requirements.

Retirement Allowance: 72% of salary plus an annuity based on accumulated member contributions, with interest. This amount is not to exceed 100% of pay. For those who became members in service after January 1, 1988 or who have not been members in service continually since that date, the amount is limited to 75% of pay. There is an additional pension of \$559.44 per year (or \$312.00 per year in systems in which the local option contained in G.L. c. 32, s.7(2)(a)(iii) has not been adopted), per child who is under 18 at the time of the member's retirement, with no age limitation if the child is mentally or physically incapacitated from earning. The additional pension may continue up to age 21 for any child who is a full time student at an accredited educational institution.

ACCIDENTAL DEATH

Eligibility: Applies to members who die as a result of a work-related injury or if the member was retired for accidental disability and the death was the natural and proximate result of the injury or hazard undergone on account of which such member was retired.

Allowance: An immediate payment to a named beneficiary equal to the accumulated deductions at the time of death, plus a pension equal to 72% of current salary and payable to the surviving spouse, dependent children or the dependent parent, plus a supplement of \$312 per year, per child, payable to the spouse or legal guardian until all dependent children reach age 18 or 21 if a full time student, unless mentally or physically incapacitated.

The surviving spouse of a member of a police or fire department or any corrections officer who, under specific and limited circumstances detailed in the statute, suffers an accident and is killed or sustains injuries resulting in his death, may receive a pension equal to the maximum salary for the position held by the member upon his death.

In addition, an eligible family member may receive a one time payment of \$100,000.00 from the State Retirement Board.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

DEATH AFTER ACCIDENTAL DISABILITY RETIREMENT

Effective November 7, 1996, Accidental Disability retirees were allowed to select Option C at retirement and provide a benefit for an eligible survivor. For Accidental Disability retirees prior to November 7, 1996, who could not select Option C, if the member's death is from a cause unrelated to the condition for which the member received accidental disability benefits, a surviving spouse will receive an annual allowance of \$6,000.

DEATH IN ACTIVE SERVICE

Eligibility: At least 2 years of service

Allowance: An immediate allowance equal to that which would have been payable had the member retired and elected Option C on the day before his or her death. For death occurring prior to the member's superannuation retirement age, the age 55 benefit rate is used. The minimum annual allowance payable to the surviving spouse of a member in service who dies with at least two years of creditable service is \$3,000, provided that the member and the spouse were married for at least one year and living together on the member's date of death.

The surviving spouse of such a member in service receives an additional allowance equal to the sum of \$1,440 per year for the first child and \$1,080 per year for each additional child until all dependent children reach age 18 or 22 if a full time student, unless mentally or physically incapacitated.

COST OF LIVING

If a system has accepted Chapter 17 of the Acts of 1997, and the Retirement Board votes to pay a cost of living increase for that year, the percentage is determined based on the increase in the Consumer Price Index used for indexing Social Security benefits, but cannot exceed 3.0%. Section 51 of Chapter 127 of the Acts of 1999, if accepted, allows boards to grant COLA increases greater than that determined by CPI but not to exceed 3.0%. The first \$12,000 of a retiree's total allowance is subject to a cost-of-living adjustment. The total Cost-of-Living adjustment for periods from 1981 through 1996 is paid for by the Commonwealth of Massachusetts.

10. SUMMARY OF PLAN PROVISIONS *(continued)*

METHODS OF PAYMENT

A member may elect to receive his or her retirement allowance in one of 3 forms of payment.

Option A: Total annual allowance, payable in monthly installments, commencing at retirement and terminating at the member's death.

Option B: A reduced annual allowance, payable in monthly installments, commencing at retirement and terminating at the death of the member, provided, however, that if the total amount of the annuity portion received by the member is less than the amount of his or her accumulated deductions, including interest, the difference or balance of his accumulated deductions will be paid in a lump sum to the retiree's beneficiary or beneficiaries of choice.

Option C: A reduced annual allowance, payable in monthly installments, commencing at retirement. At the death of the retired employee, 2/3 of the allowance is payable to the member's designated beneficiary (who may be the spouse, or former spouse who remains unmarried for a member whose retirement becomes effective on or after February 2, 1992, child, parent, sister, or brother of the employee) for the life of the beneficiary. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases (or "pops up") based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable "pops up" in the same fashion. The Option C became available to accidental disability retirees on November 7, 1996.

ALLOCATION OF PENSION COSTS

If a member's total creditable service was partly earned by employment in more than one retirement system, the cost of the "pension portion" is allocated between the different systems pro rata based on the member's service within each retirement system.

II. GLOSSARY OF TERMS

ACTUARIAL ACCRUED LIABILITY

That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

ACTUARIAL ASSUMPTIONS

Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

ACTUARIAL COST METHOD (OR FUNDING METHOD)

A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the Normal Cost and the Actuarial Accrued Liability.

ACTUARIAL GAIN OR LOSS (OR EXPERIENCE GAIN OR LOSS)

A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

Note: The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or pension plan provisions would be described as such, not as an Actuarial Gain (Loss).

ACTUARIAL PRESENT VALUE

The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

AMORTIZATION PAYMENT

That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

II. GLOSSARY OF TERMS *(continued)*

ANNUAL STATEMENT

The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

ANNUITY RESERVE FUND

The fund into which total accumulated deductions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

ANNUITY SAVINGS FUND

The fund in which employee contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

ASSETS

The value of securities as described in Section VIII.

COST OF BENEFITS

The estimated payment from the pension system for benefits for the fiscal year. This is the minimum amount payable during the first six years of some Funding Schedules.

FUNDING SCHEDULE

The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB

Governmental Accounting Standards Board

II. GLOSSARY OF TERMS *(continued)*

NORMAL COST

Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits, which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

PENSION FUND

The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

PENSION RESERVE FUND

The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

SPECIAL FUND FOR MILITARY SERVICE CREDIT

The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

UNFUNDED ACCRUED LIABILITY

The excess of the Actuarial Accrued Liability over the Assets.

Commonwealth of Massachusetts
Public Employee Retirement Administration Commission
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